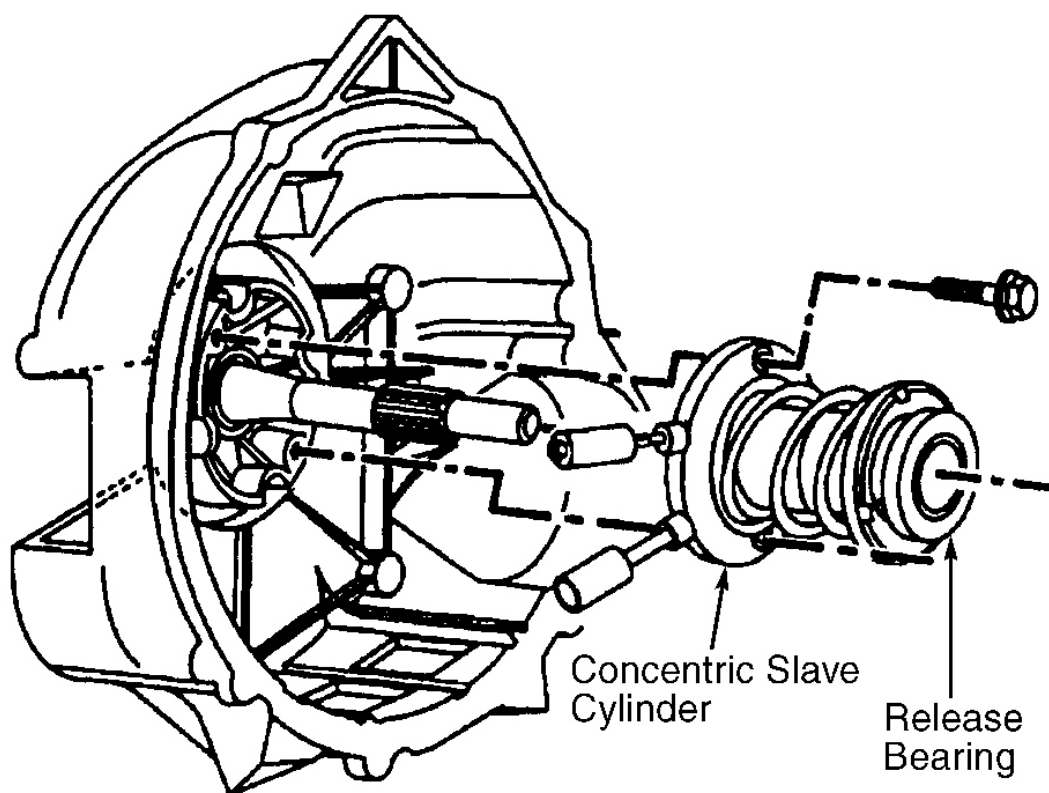


1996-97 CLUTCHES**General Motors Corp. Trucks****DESCRIPTION**

The hydraulic clutch system consists of a clutch plate, pressure plate, release bearing and pilot bearing. Hydraulic clutch has a master cylinder with a reservoir. Clutch pedal moves master cylinder push rod which activates a concentric slave (actuator) cylinder located in transmission bellhousing, which moves the release bearing. See **Fig. 1**.

Hydraulic clutch system provides automatic clutch adjustment. No adjustment of clutch linkage or pedal position is required. Master cylinder, hydraulic line and actuator cylinder assembly is furnished pre-filled and pre-bled.



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Fig. 1: Identifying Concentric Clutch Slave Cylinder
Courtesy of GENERAL MOTORS CORP.

LUBRICATION

1997 Chevrolet S10 Pickup

1996-97 CLUTCHES General Motors Corp. Trucks

RECOMMENDED FLUID

TRANSMISSION/TRANSFER CASE LUBRICATION FLUID

Application	Fluid Type
Transmission	
C/K Series	
NV3500	GM Synchro-Mesh Transmission Oil (12345349)
NV4500	Castrol Syntorq LT Transmission Oil
S/T Series	
NV1500	GM Synchro-Mesh Transmission Oil With Friction Modifier (12377916)
NV3500	GM Synchro-Mesh Transmission Oil (12345349)
P Series NV4500	Castrol Syntorq LT Transmission Oil
Transfer Case	
C/K Series	Dexron-III
S/T Series	Dexron-III

ADJUSTMENTS

NOTE: The hydraulic clutch system provides automatic clutch adjustment; no manual clutch adjustments are necessary.

BLEEDING CLUTCH SYSTEM

NOTE: DO NOT reuse fluid that has been bled from system.

1. First clean and then remove reservoir cap. Top-off reservoir with NEW DOT 3 brake fluid.
2. Have an assistant depress and hold clutch pedal. Open bleed screw located on left side of transmission to expel air. Close bleed screw and release clutch pedal.
3. Repeat step 2) until all air is out of system. Check and refill reservoir as needed during bleeding to remove air from system. After bleeding, pump clutch pedal several times. If clutch engagement is not satisfactory, repeat bleeding procedure.
4. If normal bleeding procedure is unsuccessful, perform the following:
 - Remove reservoir cap.
 - Pump pedal very fast for 30 seconds.
 - Stop to allow air to escape.
 - Repeat procedure as necessary.

DRIVE SHAFT PARKING BRAKE (C/K SERIES)

1997 Chevrolet S10 Pickup

1996-97 CLUTCHES General Motors Corp. Trucks

1. Remove clevis pin from parking brake lever. Set parking brake by pushing pedal down 18 degrees. Insert a .125" (3 mm) pin into locating hole in pedal assembly. See **Fig. 2** . Push pedal down until pin contacts parking brake outer flange. Install tension scale with a small length of cable or chain, and a tightening device (i.e. turn buckle) on frame. Install small chain on lever near spring at bottom of lever. See **Fig. 3** .
2. Tighten tightening device until tension scale reads 50 ft. lb. (222 N.m). Loosen nut and turn clevis until pin slides freely in lever with all slack removed from cable. Install clevis pin and cotter pin. Remove tension scale and all extensions used. Release parking brake. Rotate drum to make sure that there is no drag.

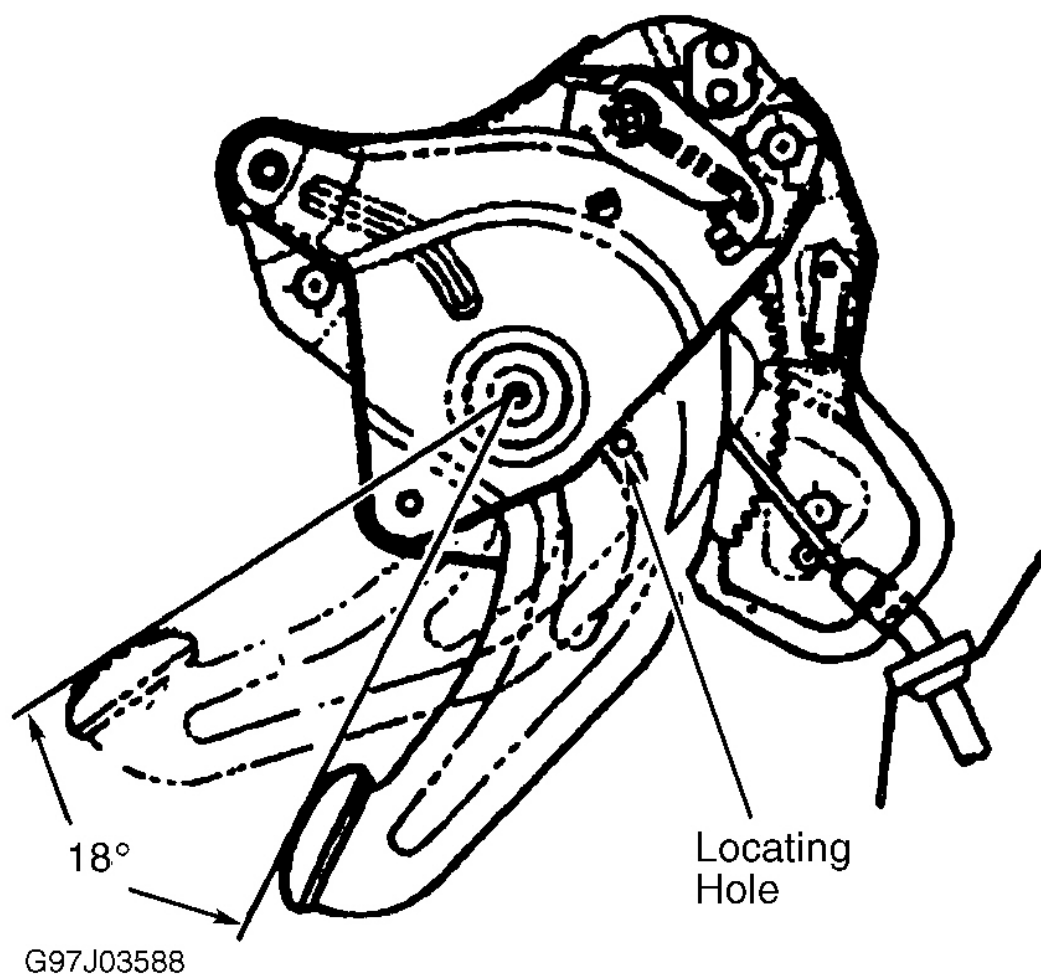


Fig. 2: Identifying Brake Adjustment Locating Hole (C/K Series)
Courtesy of GENERAL MOTORS CORP.

1997 Chevrolet S10 Pickup

1996-97 CLUTCHES General Motors Corp. Trucks

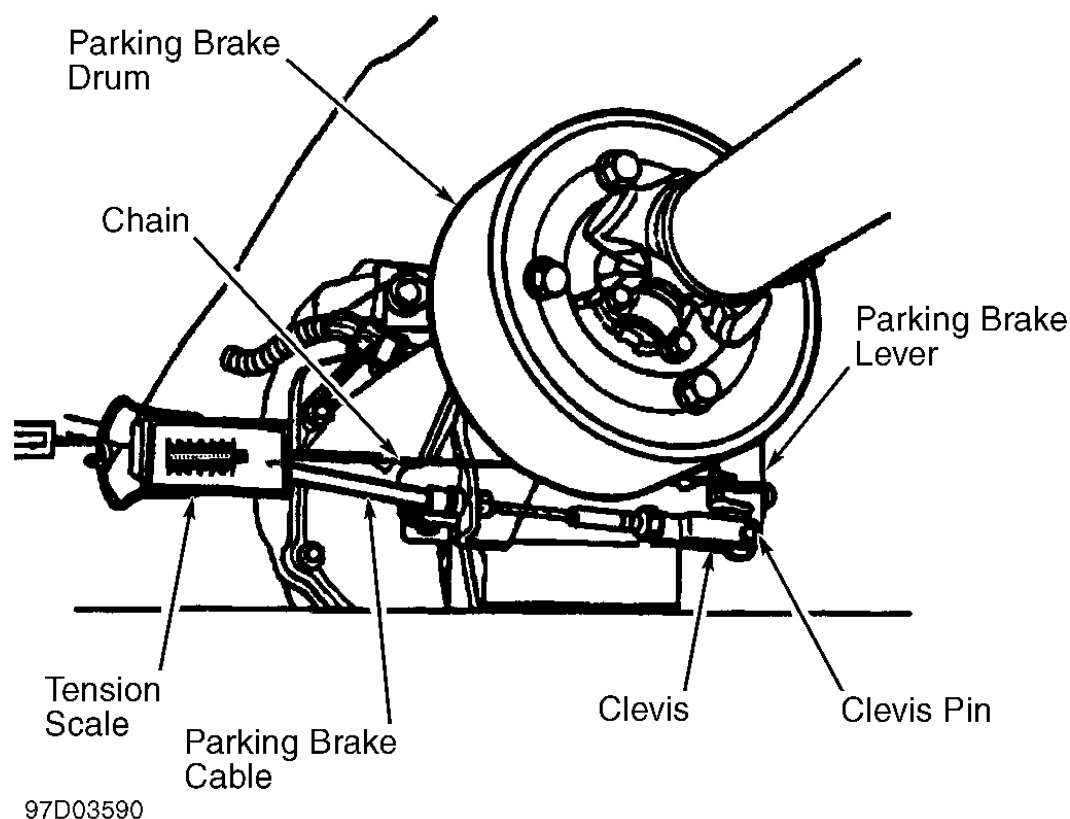


Fig. 3: Identifying Drive Shaft Parking Brake Components (C/K Series)
Courtesy of GENERAL MOTORS CORP.

DRIVE SHAFT PARKING BRAKE (P SERIES)

Raise and support vehicle. Install drum over first rivet section, leaving adjuster screw accessible. Place two .010" (.254 mm) shims between both shoes and drum. Shims should be 140-180 degrees apart. Rotate adjuster screw until shims indicate spacing has been met (no clearance). Remove shims and complete drum installation. Rotate drum. Drum should spin freely with only a slight drag.

TRANSFER CASE LINKAGE (C/K SERIES)

Place shift lever in 4-HI position. Raise and support vehicle. Disconnect linkage rod from console shift lever. Shift transfer case into 4-HI position by moving transfer case shift lever in full back position. A clicking sound will indicate that transfer case lever is in full back position. Adjust swivel to align with notch in console shift lever. Connect linkage rod to console shift lever.

TRANSFER CASE CABLE (S/T SERIES)

1997 Chevrolet S10 Pickup

1996-97 CLUTCHES General Motors Corp. Trucks

Remove shift lever knob retainer and shift lever knob. Remove front floor console. Place shift lever in Neutral position. Pry control cable end from shift lever. Loosen control cable lock nut. Ensure transfer case is in Neutral position. Place shift lever in Neutral position. Turn shift lever end of cable in or out, until it is aligned with shift lever. Install control cable to shift lever and control cable lock nut.

TROUBLE SHOOTING

NOTE: For trouble shooting not covered in this article, see appropriate table in **TROUBLE SHOOTING** article in **GENERAL INFORMATION**.

Hydraulic system should not require additional fluid under normal circumstances. Reservoir fluid level will increase as normal clutch wear occurs. Avoid overfilling or removing fluid from reservoir. This will cause clutch release problems.

TESTING

Apply parking brake. Block vehicle wheels. Shift transmission into Neutral. Start engine and run at idle. Engage clutch. Disengage clutch. Wait 9 seconds. Shift transmission into Reverse. If grinding noise is heard, see appropriate table in **TROUBLE SHOOTING** article in **GENERAL INFORMATION**.

REMOVAL & INSTALLATION

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See **COMPUTER RELEARN PROCEDURES** article in **GENERAL INFORMATION** before disconnecting battery.

TRANSMISSION

NOTE: **DO NOT** disassemble transmission shift housing. Internal parts for shift housing are not available. Also, opening shift housing voids warranty.

Removal (C/K & P Series)

1. Disconnect negative battery cable. Shift transmission into 3rd or 4th gear. Remove shift lever retainer screws and retainer. Remove 8 shift lever boot mounting screws and boot. Remove shift lever insulator. Remove shift lever. Remove 4 exposed bolts on base of housing, not bolts under rubber boot located at top of housing. Remove insulator from transmission case. Raise and support vehicle. Drain transmission fluid.
2. Mark drive shaft for reassembly reference. Remove drive shaft(s). On 4WD, remove transfer case shield. Drain oil from transfer case. Remove vent hose and electrical connectors. Remove transfer case shift linkage. Using a jack, support transfer case. Remove transfer case and discard transmission adapter gasket.
3. On vehicles equipped with drive shaft parking brake, release parking brake. Raise and support vehicle.

1997 Chevrolet S10 Pickup

1996-97 CLUTCHES General Motors Corp. Trucks

Remove nut and washer from center of brake drum. Remove drum yoke assembly, bolts, washers and drum yoke. Remove cotter pin, clevis pin, clevis, and nut from brake cable. Remove parking brake cable grommet, and cable from bracket.

4. On all vehicles, disconnect exhaust pipes from exhaust manifold, and catalytic converter from muffler assembly (if necessary). Disconnect electrical connectors from speed sensor and back-up light switch. Using Quick Connect Disconnect Tool (J-36221), remove clutch line from concentric slave cylinder quick connect coupling. See **Fig. 4** . Remove starter and clutch housing cover. Remove transmission vent hose.
5. Support transmission and engine. Remove crossmember. Remove clutch plate and clutch cover from flywheel. Remove transmission-to-engine bolts and studs. Pull transmission straight back on clutch hub splines. Remove clutch and clutch cover plates during transmission-to-engine separation. Remove transmission.

Installation

1. To install, reverse removal procedure. If equipped with drive shaft parking brake, adjust parking brake. See **DRIVE SHAFT PARKING BRAKE (C/K SERIES)** or **DRIVE SHAFT PARKING BRAKE (P SERIES)** under ADJUSTMENTS. On 4WD, install NEW transmission adapter gasket. Adjust transfer case shift linkage. See **TRANSFER CASE LINKAGE (C/K SERIES)** under ADJUSTMENTS.
2. Lightly coat input shaft splines with high-temperature grease. Tighten bolts to specifications. See **TORQUE SPECIFICATIONS (C/K SERIES)** table or **TORQUE SPECIFICATIONS (P SERIES)** table. Fill transmission and transfer case with fluid. See **TRANSMISSION/TRANSFER CASE LUBRICATION FLUID** table under LUBRICATION.

Removal (S/T Series)

1. Disconnect negative battery cable. Shift transmission into 3rd or 4th gear. Remove shift lever knob and nut. Remove shift lever retainer screws and retainer (if equipped). Remove shift lever boot mounting screws and boot. Remove shift lever and nut.
2. Remove exposed bolts on base of housing. DO NOT remove bolts under rubber boot at top of housing. Remove shift lever housing. Raise and support vehicle. Drain transmission fluid. Remove parking brake cable for clearance. Mark drive shaft(s) for reassembly reference. Remove drive shaft(s).
3. Disconnect electrical connectors from speed sensor and back-up switch. On all models, disconnect exhaust pipe from exhaust manifold. Remove catalytic converter and hanger. If equipped, remove right and left side transfer case-to-transmission braces. On 4WD, place transfer case in 4H position. Remove skid plate. Drain fluid from transfer case. Disconnect vacuum lines and electrical connectors from transfer case (if equipped).
4. Disconnect shift cable from transfer case. Support transfer case with jack. Remove transfer case-to-transmission mounting bolts. Slide transfer case rearward until free of transmission output shaft. Lower and remove transfer case. Remove and discard gasket. Using Quick Connect Disconnect Tool (J-36221), remove clutch line from concentric slave cylinder quick connect coupling. See **Fig. 4** .
5. Remove clutch housing cover. Remove clutch plate and clutch cover from flywheel. Support transmission. Using a fuel pressure gauge, purge fuel system, and disconnect fuel lines. Remove fuel lines and retainers from rear crossmember. Remove rear crossmember. Move wiring harness away from transmission oil pan.
6. Lower transmission enough to gain access to top of transmission. Remove wiring harness from front

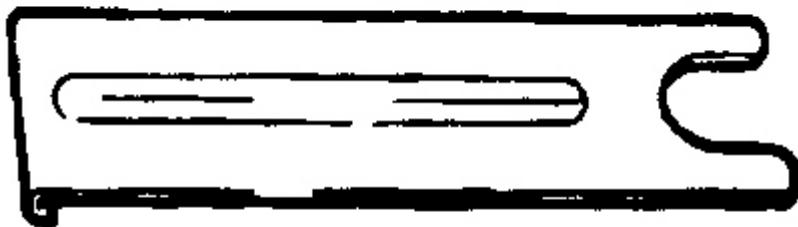
1997 Chevrolet S10 Pickup

1996-97 CLUTCHES General Motors Corp. Trucks

crossmember. Remove engine block ground. Remove transmission mounting bolts as necessary. Pull transmission straight back on clutch hub splines, and remove transmission.

Installation

To install, reverse removal procedure. On 4WD, install NEW transmission adapter gasket. Adjust transfer case shift cable. See **TRANSFER CASE CABLE** under ADJUSTMENTS. Lightly coat input shaft splines with high-temperature grease. Tighten bolts to specifications. See **TORQUE SPECIFICATIONS (S/T SERIES)** table. Fill transmission with fluid. See **TRANSMISSION/TRANSFER CASE LUBRICATION FLUID** table under LUBRICATION.



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Fig. 4: Hydraulic Clutch Line Separator (Quick Connect Disconnect Tool)

Courtesy of GENERAL MOTORS CORP.

CLUTCH ASSEMBLY & PILOT BEARING

WARNING: DO NOT use compressed air to clean clutch parts. Clutch plate contains asbestos and is harmful when inhaled.

Removal (C/K & P Series)

1. Remove transmission. See **TRANSMISSION** . Install Clutch Alignment Tool (J-5824-01) to support clutch plate. Mark flywheel and pressure plate for reassembly reference. See **Fig. 5** .
2. Evenly loosen pressure plate bolts 1-2 turns at a time until pressure plate spring tension is released. Remove clutch plate and pressure plate. Remove clutch aligner. Remove pilot bearing, if worn or damaged, using Pilot Bearing Puller (J-23907). Remove concentric slave cylinder and release bearing. See **CONCENTRIC SLAVE (ACTUATOR) CYLINDER** .

Inspection

1997 Chevrolet S10 Pickup

1996-97 CLUTCHES General Motors Corp. Trucks

1. Clean all components with water-dampened cloth to remove asbestos fibers. Clean flywheel housing with solvent. Release bearing is permanently packed with lubricant and should not be cleaned with solvent.
2. Inspect all components for wear or damage. Inspect all contact surfaces for scoring, warping and damage. Clutch plate runout must not exceed .20" (.508 mm). Inspect friction surfaces for excessive oil. Inspect splines for nicks, burrs and sliding fit. Bellhousing transmission pilot hole runout should not exceed .015" (.38 mm).

Installation

1. On 4.3L, 5.0L and 5.7L, use brass drift to install NEW pilot bearing into flywheel, if removed. On 6.5L diesel, use Pilot Bearing Driver (J-34140) to install NEW pilot bearing into flywheel, if removed. On 4.3L, 5.0L and 5.7L, lubricate pilot bearing with machine oil. On 6.5L diesel, pilot bearing is sealed and does not require lubrication.
2. Install clutch aligner to support clutch plate. Install clutch plate and pressure plate to flywheel. Ensure reference marks are aligned. If installing NEW clutch plate and pressure plate, align lightest part of clutch cover, identified by a yellow dot, with heaviest part of flywheel part of flywheel, identified by an "X". Install and tighten NEW spring washers and bolts evenly to avoid distortion. Remove clutch aligner.
3. Lubricate O.D. groove and pack grease into I.D. recess of release bearing. To complete installation, reverse removal procedure. Tighten bolts to specifications. See **TORQUE SPECIFICATIONS (C/K SERIES)** or **TORQUE SPECIFICATIONS (P SERIES)** table. Fill reservoir with fluid. See **TRANSMISSION/TRANSFER CASE LUBRICATION FLUID** table under LUBRICATION. Bleed system. See **BLEEDING CLUTCH SYSTEM**.

Removal (S/T Series)

1. Remove transmission. See **TRANSMISSION**. Remove slave cylinder and release bearing. Install Clutch Aligner (J-33169) to support clutch plate. Mark flywheel, clutch plate and pressure plate for reassembly reference.
2. Evenly loosen pressure plate bolts 1-2 turns at a time until clutch plate spring tension is released. Remove clutch plate and pressure plate. Remove clutch aligner. Remove pilot bearing if worn or damaged using Pilot Bearing Puller (J-23907).

Inspection

1. Clean all components with water-dampened cloth to remove asbestos fibers. Clean clutch fork, bellhousing and ball stud with solvent. Release bearing is permanently packed with lubricant and should not be cleaned with solvent.
2. Inspect all components for wear or damage. Inspect all contact surfaces for scoring, warping and damage. Clutch plate runout must not exceed .20" (.508 mm). Inspect friction surfaces for excessive oil. Inspect splines for nicks, burrs and sliding fit.

Installation

1. Use Pilot Bearing Installer (J-26516-A) with Driver Handle (J-8092) to install NEW pilot bearing into flywheel, if removed. See **Fig. 1**. Lubricate pilot bearing with machine oil. Install Clutch Aligner (J-33169) to support clutch plate. Install clutch plate and pressure plate to flywheel. Ensure reference marks

1997 Chevrolet S10 Pickup

1996-97 CLUTCHES General Motors Corp. Trucks

are aligned.

2. Install and tighten NEW spring washers and bolts evenly to avoid distortion. Remove clutch aligner. Lubricate O.D. groove and pack grease into I.D. recess of release bearing.
3. To complete installation, reverse removal procedure. Tighten bolts to specifications. See **TORQUE SPECIFICATIONS (S/T SERIES)** table. Fill reservoir with fluid. See **TRANSMISSION/TRANSFER CASE LUBRICATION FLUID** under LUBRICATION. Bleed system. See **BLEEDING CLUTCH SYSTEM**.

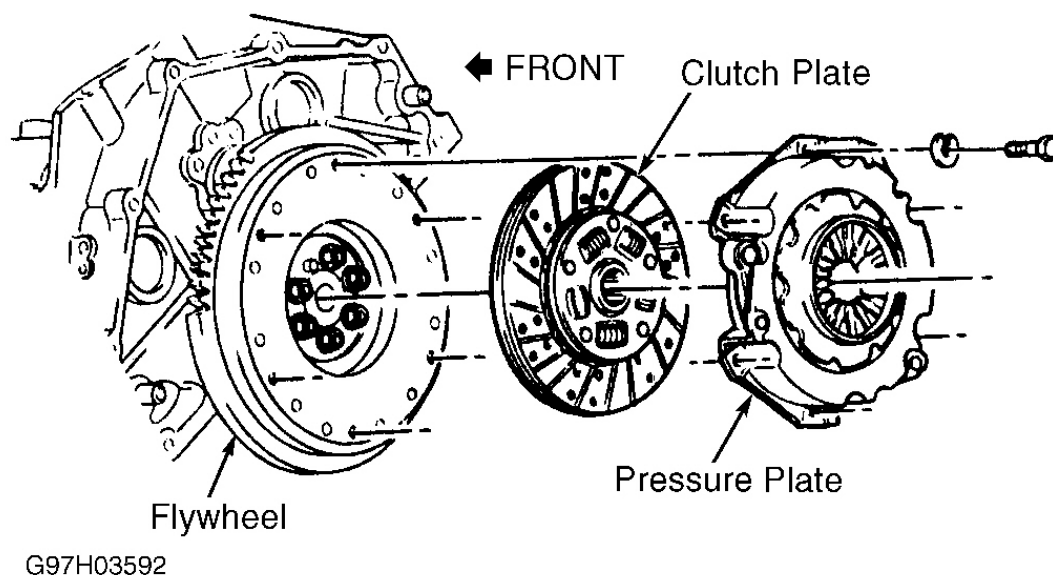


Fig. 5: Exploded View Of Clutch Assembly
Courtesy of GENERAL MOTORS CORP.

MASTER CYLINDER & RESERVOIR

WARNING: Vehicles are equipped with air bag supplemental restraint system. Before attempting ANY repairs involving steering column, instrument panel or related components, see SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM in the appropriate AIR BAG RESTRAINT SYSTEMS article.

NOTE: Master cylinder is serviced as an assembly along with master cylinder reservoir and tubing. Replacement of individual components cannot be performed. A complete pre-filled, pre-bled master cylinder assembly must be installed.

Removal

Disconnect negative battery cable. Separate push rod from clutch pedal. Using Quick Connect Disengagement

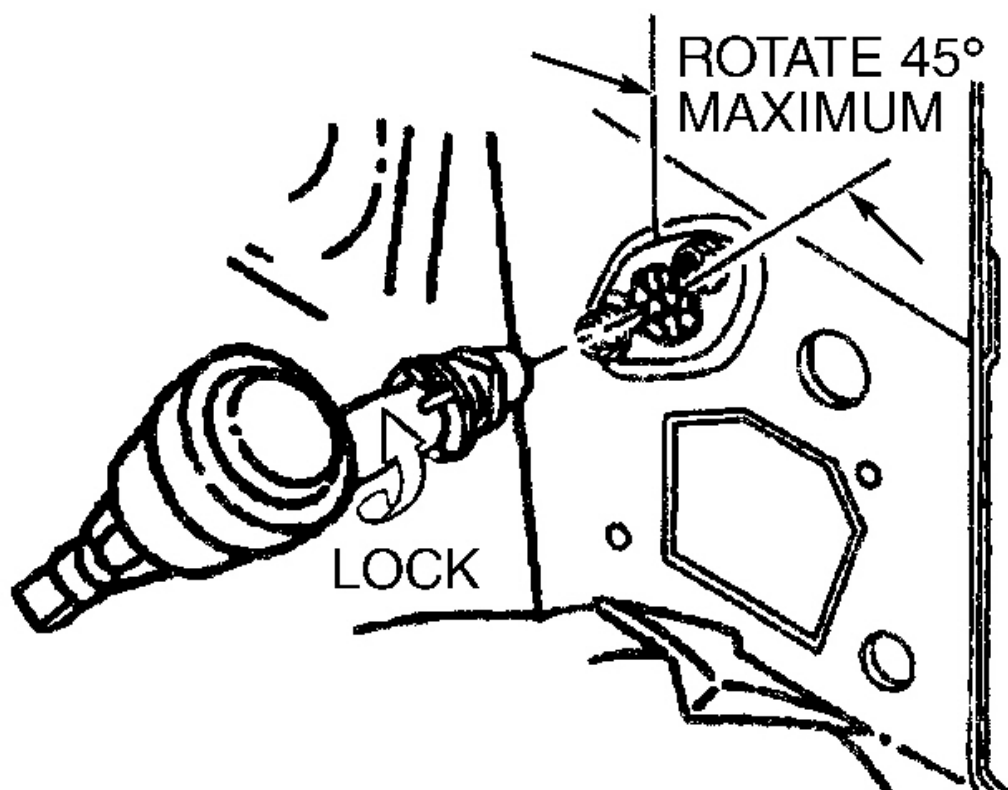
1997 Chevrolet S10 Pickup

1996-97 CLUTCHES General Motors Corp. Trucks

Tool (J-36221), remove hydraulic line from concentric slave cylinder at transmission. Remove line clips from wiring harness bracket and sheet metal. Rotate master cylinder body 45 degrees clockwise and remove from cowl panel. See **Fig. 6**.

Installation

To complete installation, reverse removal procedure. Tighten bolts to specifications. See **TORQUE SPECIFICATIONS**. Top off reservoir with fluid. See **TRANSMISSION/TRANSFER CASE LUBRICATION FLUID** table under LUBRICATION. Bleed system. See **BLEEDING CLUTCH SYSTEM**.



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Fig. 6: Master Cylinder Removal

Courtesy of GENERAL MOTORS CORP.

CONCENTRIC SLAVE (ACTUATOR) CYLINDER

Removal & Installation

1997 Chevrolet S10 Pickup

1996-97 CLUTCHES General Motors Corp. Trucks

Using Hydraulic Clutch Line Separator (J-36221), depress the White plastic sleeve to separate coupling. See **Fig. 4** . Protect both halves of coupling to prevent contamination. Remove transmission. See **TRANSMISSION** . Remove bolts securing concentric slave cylinder to clutch housing shaft. Remove slave cylinder assembly from transmission input shaft. Remove release bearing from slave cylinder. For installation, reverse removal procedure.

OVERHAUL

NOTE: All master and concentric slave (actuator) cylinders are serviced as an assembly. Rebuilding or overhaul is not possible.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS (C/K SERIES)

Application	Ft. Lbs. (N.m)
Bellhousing-To-Engine Bolts	35 (47)
Bellhousing-To-Transmission Bolts	74 (100)
Crossmember Bolts	38 (51)
Lower PTO Cover Bolt (Oil Drain On NV4500)	27 (37)
Oil Fill Plug (NV4500)	30 (41)
Oil Fill & Drain Plugs (NV3500)	44 (60)
Parking Brake Drum To Yoke Bolts	27 (37)
Parking Brake Yoke Shaft Nut	350 (475)
Pressure Plate-To-Flywheel Bolts	
Gasoline engine	29 (40)
Diesel engine	25 (34)
Shift Housing Bolts	11 (15)
Transfer Case-To-Transmission Bolts	24 (33)
INCH Lbs. (N.m)	
Clutch Housing Cover Bolts	89 (10)
Slave Cylinder Bolts	71 (8)

TORQUE SPECIFICATIONS (P SERIES)

Application	Ft. Lbs. (N.m)
Lower PTO Cover Bolt (Oil Drain On NV4500)	30 (41)
Oil Fill Plug (NV4500)	30 (41)
Parking Brake Drum To Transmission	65 (88)
Parking Brake Yoke Shaft Nut	325 (441)
Shift Lever Nut	15 (20)
Transmission To Engine Studs	23 (31)
INCH Lbs. (N.m)	
Clutch Housing Cover Bolts	89 (10)

1997 Chevrolet S10 Pickup

1996-97 CLUTCHES General Motors Corp. Trucks

Shift Housing Bolts

89 (10)

TORQUE SPECIFICATIONS (S/T SERIES)

Application	Ft. Lbs. (N.m)
Adapter-To-Transmission Bolts	31 (42)
Bellhousing-To-Engine Bolts	35 (47)
Pressure Plate-To-Flywheel Bolts	29 (40)
Rear Crossmember Bolts	34 (46)
Skid Plate Bolts	25 (34)
Support Brace Bolts	35 (47)
Transfer Case Oil Drain & Fill Plugs	18 (25)
Transfer Case-To-Transmission Bolts	41 (55)
Transmission Brace To Engine Bolts	37 (50)
Transmission Brace To Engine Studs	35 (47)
Transmission Oil Fill & Drain Plugs (NV3500)	44 (60)
Transmission Oil Fill Plug (NV1500)	17 (24)
INCH Lbs. (N.m)	
Clutch Housing Cover Bolts	62 (7)
Concentric Slave Cylinder Bolts	80 (9)
Reservoir Bolts	27 (3)